

## **Description of Additional Supplementary Files**

File Name: Supplementary Movie 1

Description: The comparison of disassembly processes between bare Fe<sub>3</sub>O<sub>4</sub> assembly and Fe<sub>3</sub>O<sub>4</sub>@G assembly.

File Name: Supplementary Movie 2

Description: Dynamic rotation of the CA assembly of Fe<sub>3</sub>O<sub>4</sub>@G.

File Name: Supplementary Movie 3

Description: Temperature distribution of the CA assembly during dynamic evaporation under 1 and 2 sun illumination.

File Name: Supplementary Movie 4

Description: The simulated nanoparticles' movement in CA assembly during dynamic evaporation.

File Name: Supplementary Movie 5

Description: Luminescence tracing of ions movement in CA assembly at static and dynamic state.